

# DCATT Report



## DCATT - Aft Optics Jitter Tests 04-Mar-99

Identification Number:

Date: March 29, 1999

Revision: A

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### ***Purpose:***

Since previous tests suggested that the DCATT CCD mount was susceptible to vibration which was at least partly induced with the cooling water flow on, the detector was temporarily re-mounted more securely and another set of sequential images obtained with cooling water on and off on March 4, 1999.

### ***Procedure summary:***

A set of metal blocks were stacked under the CCD with a thin, rubber cushion and the detector was released from its vertical holder. This removed one of the two cantilevered mounts on the detector. The other test conditions were -

- Optical bench floated
- 10 micron pinhole source, illuminated with 633 laser with single ND6 filter prior to the pinhole
- Nominal 10ms images obtained (shutter speed = 10ms; actual exposure time likely to be ~100ms)
- Room lights on
- No windshields in place
- Data appear to be defocused.

Two data sets of 10 images each were obtained, with and without the CCD cooling water running. The image centroids were determined and compared to the average image centroid position.

### ***Summary of Results:***

Both sets of 10 images show essentially equal radial jitter of 0.16 (water on) and 0.17 (water off) pixels. With the water off set, about 80% of the images are within 0.25 pixels (radial) of the average. The water on set has one very discrepant image, about 0.5 pixels off center: removing it from the data set reduces the average radial jitter to 0.12 pixels with 100% of the centroids within 0.2 pixels. All images in both sets are more extended vertically than horizontally. At these levels, the distribution of radial centroids does not have a clear direction (previously the jitter was aligned vertically).

### ***Conclusions & Recommendations:***

- 1) The detected jitter is close to, but still exceeds the nominal system level specification of 0.1 pixels, however the improved results show the necessity of improving the CCD mount for further work.
- 2) The vertical elongation of the images likely indicates either some degree of defocused aberration or residual, vertical jitter at a frequency higher than captured with the short exposure times.

- 3) There are still some images which are disturbed more than the average. Frame 01 of the water on series is significantly discrepant from the other images of this series. Even in this series, excluding frame 1, the images do not appear to be identical though they are similarly positioned. This can be seen in the variation of the image extent throughout the series (see image 5, water on series for example, compared to other images in this series).

Data Set: 030499\_jit\_sub\_won

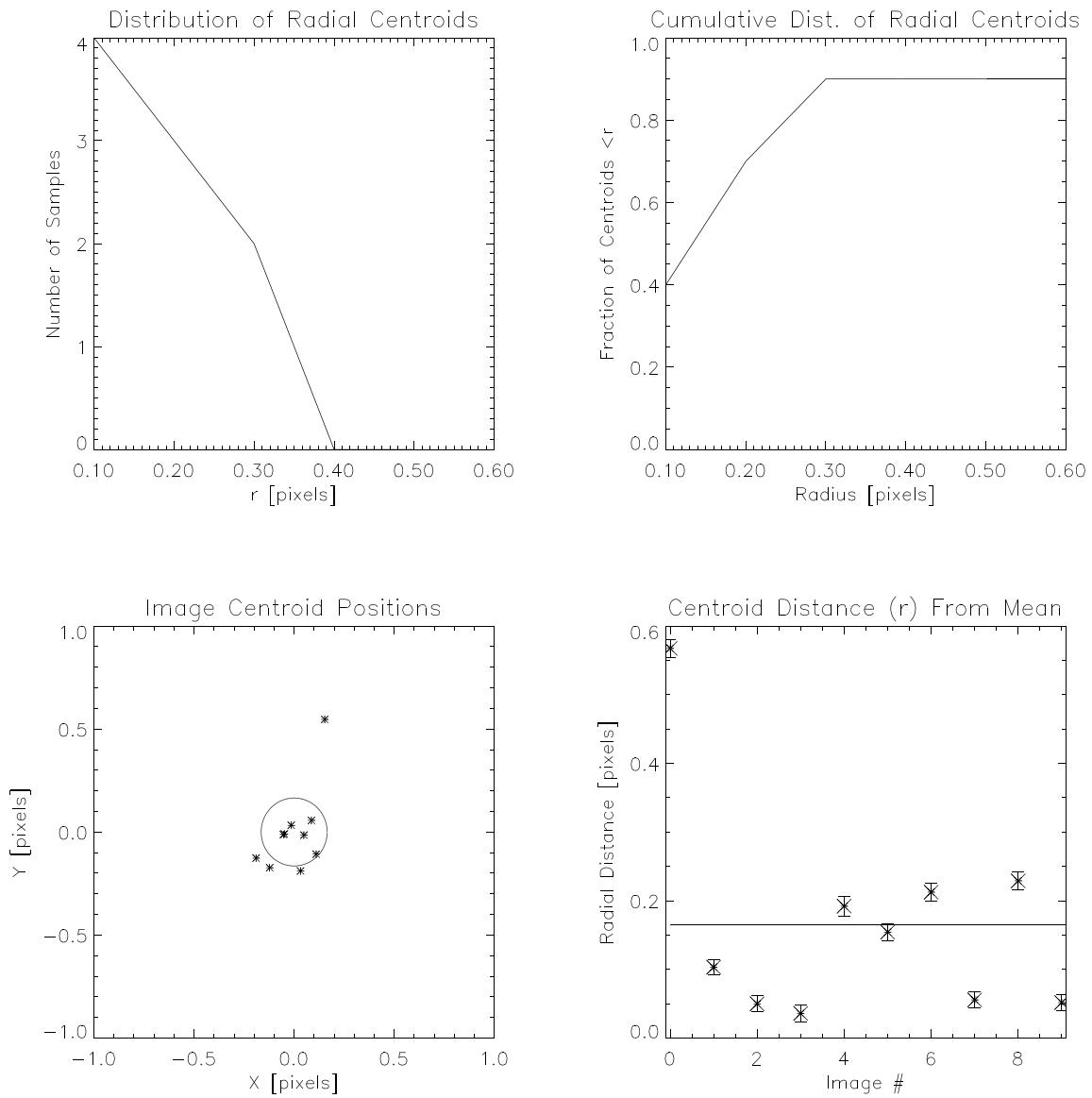
Tue Mar 9 15:03:51 1999

$\langle r \rangle = 0.16$  [pixels]

Bin size: 0.10 [pixels]

Background level subtracted: 70.

Background clip level: 0.



**Figure 1:** Data analysis plot of image set acquired with the CCD cooling water on.

Data Set: 030499\_jit\_sub\_won

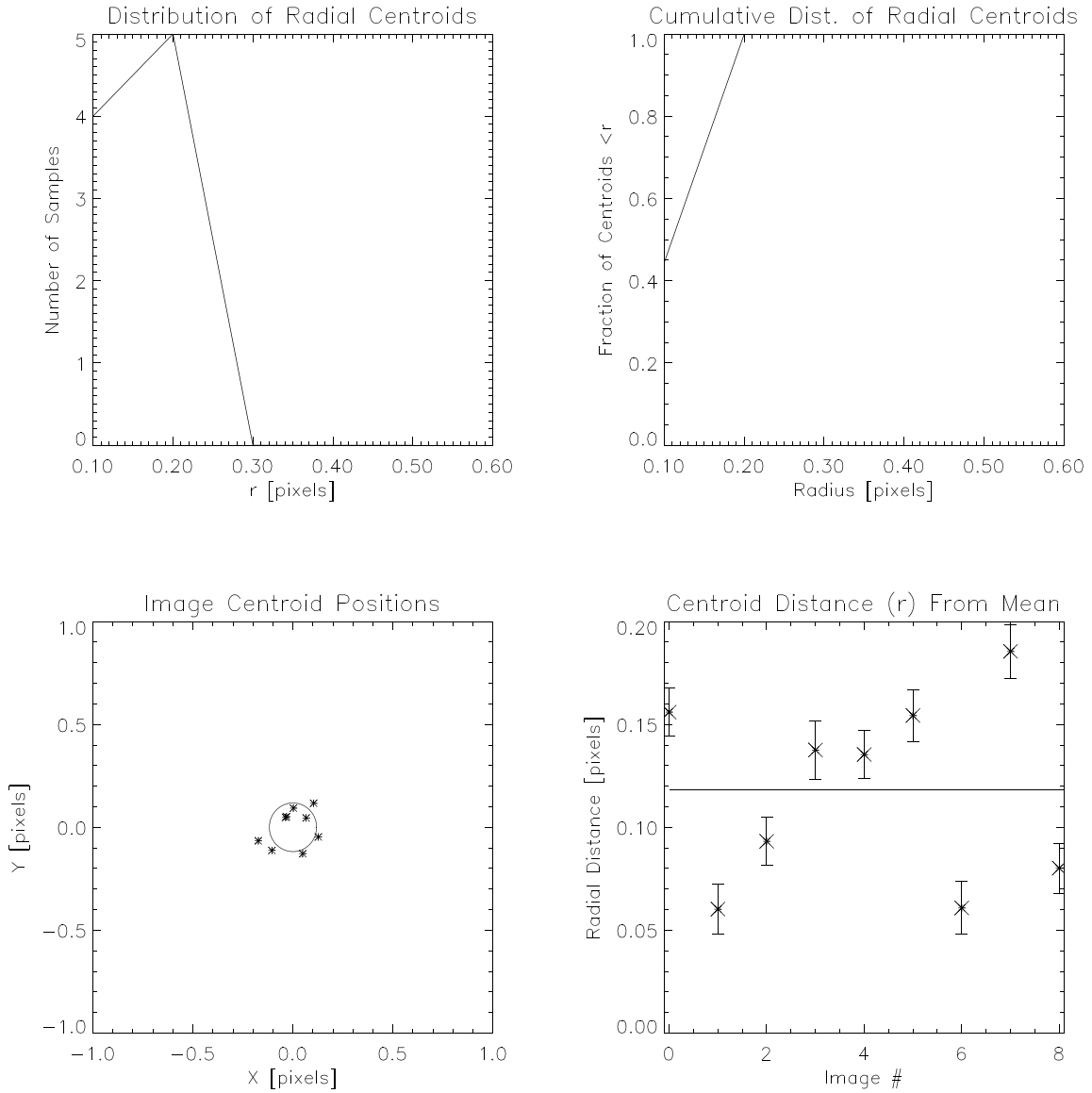
Tue Mar 9 15:15:03 1999

$\langle r \rangle = 0.12$  [pixels]

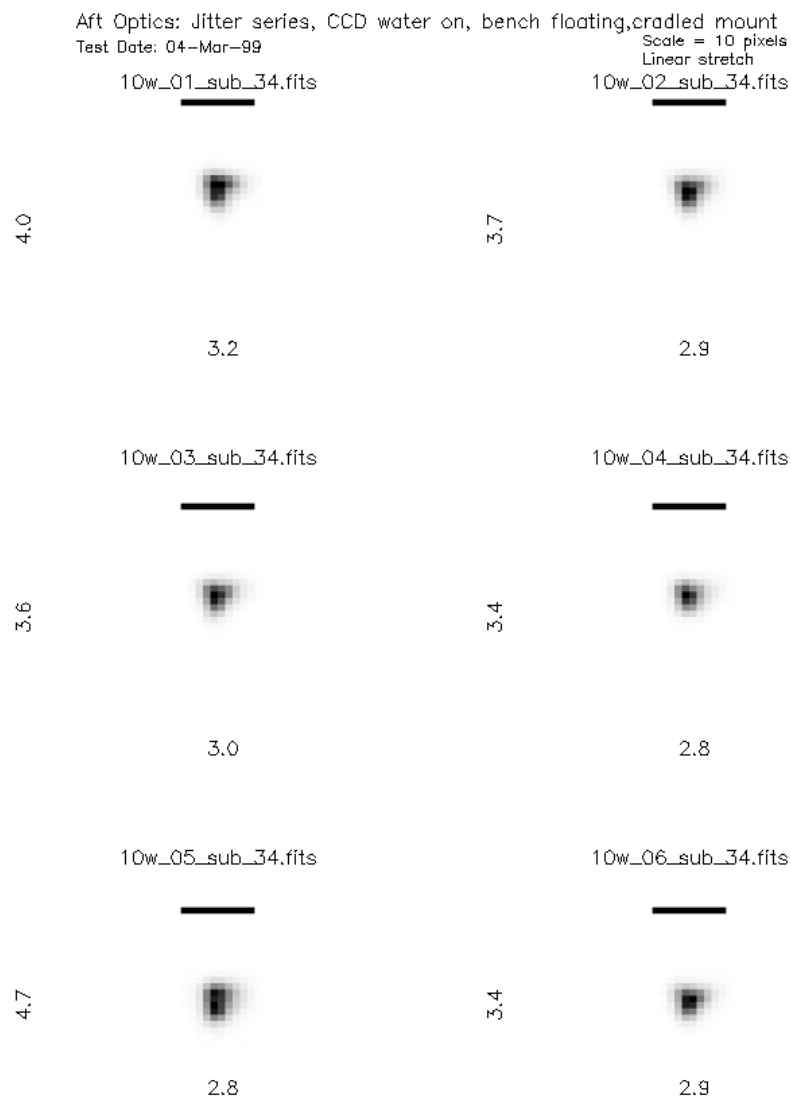
Bin size: 0.10 [pixels]

Background level subtracted: 70.

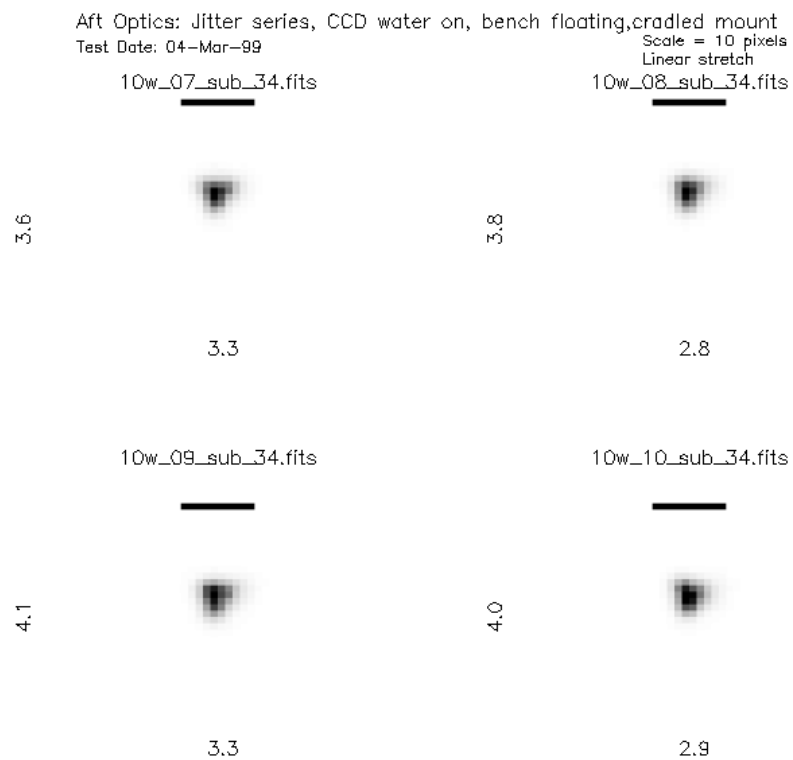
Background clip level: 0.



**Figure 2:** Data analysis plot of image set acquired with the CCD cooling water on, but excluding image #1. The centroids are all within 0.2 pixels radius with an average radial offset of 0.12 pixels.



**Figure 3:** Images #1-6 of the water on series. The Gaussian fwhm vertically and horizontally from strips three pixels wide are indicated to the left and below each image.



**Figure 4:** Images #7-10 of the water on series. The Gaussian fwhm vertically and horizontally from strips three pixels wide are indicated to the left and below each image.

Data Set: 030499\_jit\_sub\_woff

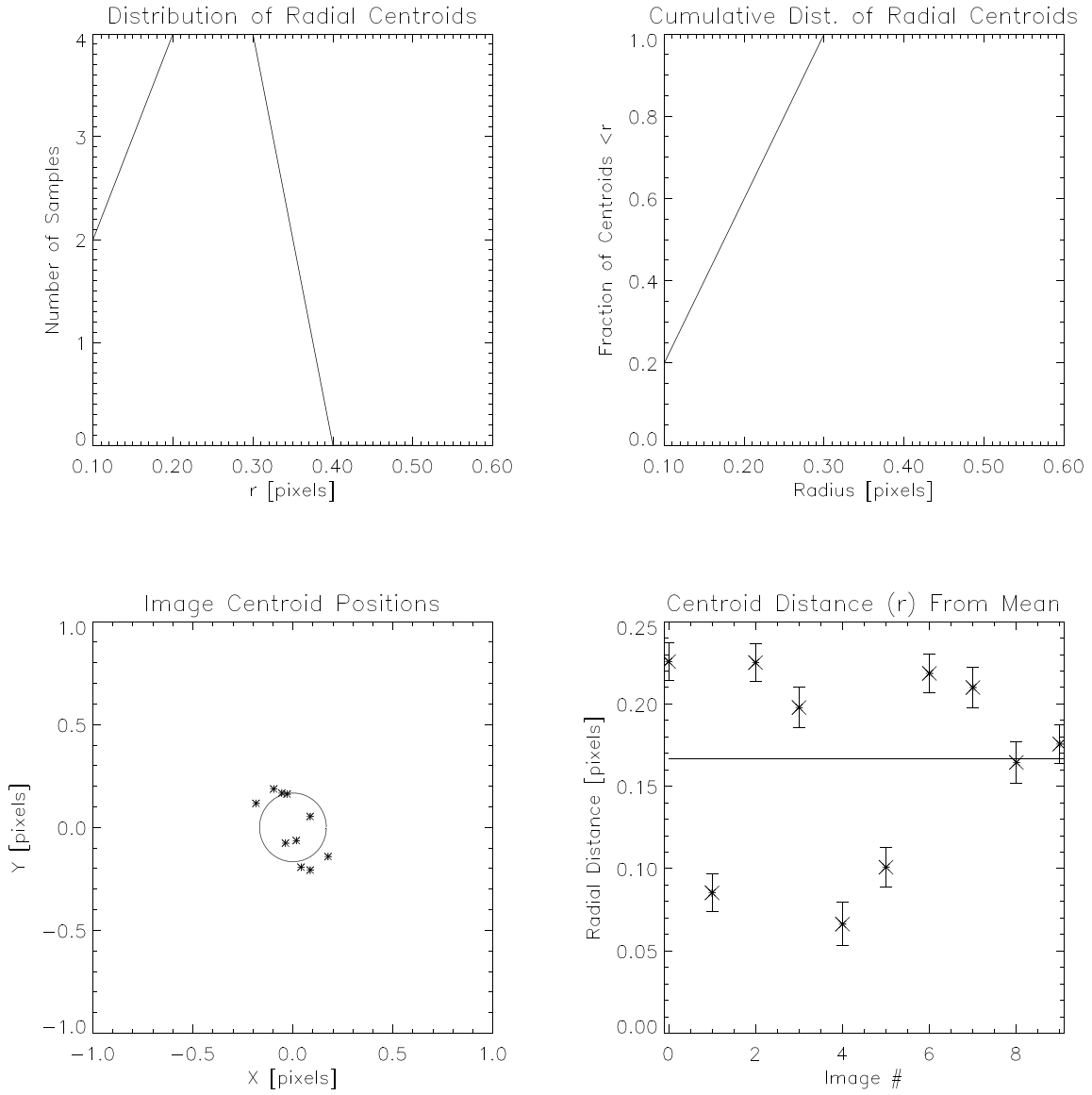
Mon Mar 8 18:09:49 1999

$\langle r \rangle = 0.17$  [pixels]

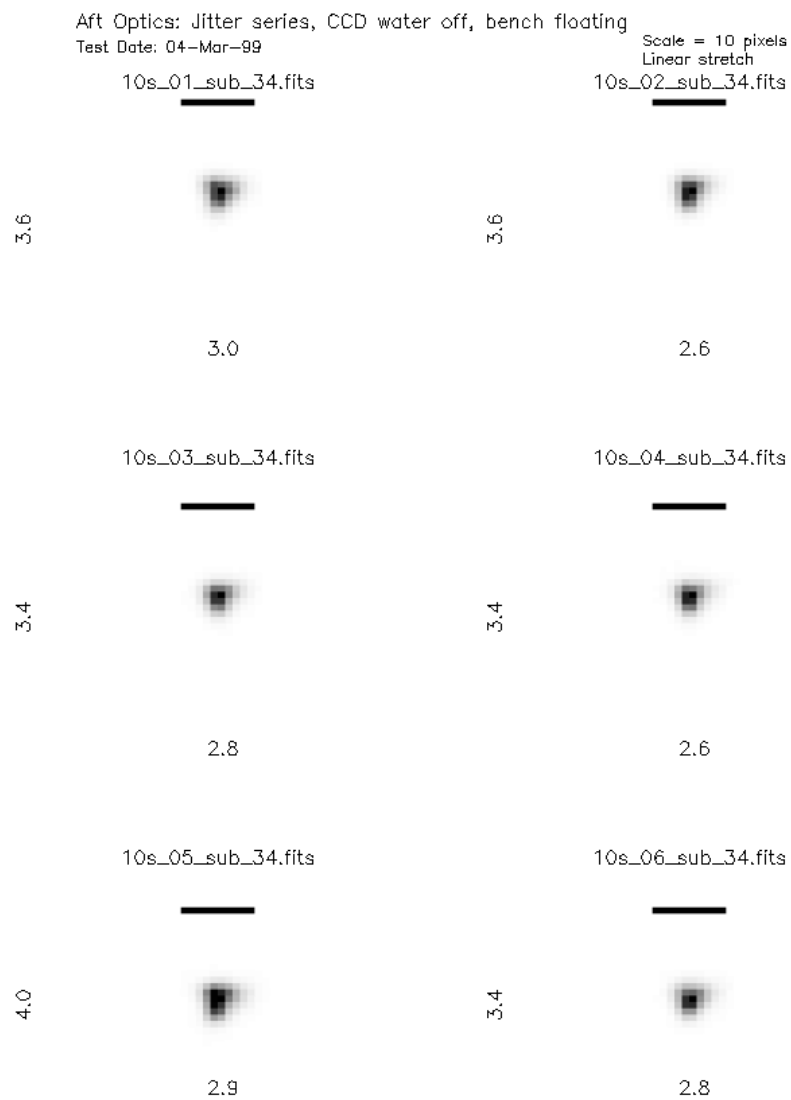
Bin size: 0.10 [pixels]

Background level subtracted: 80.

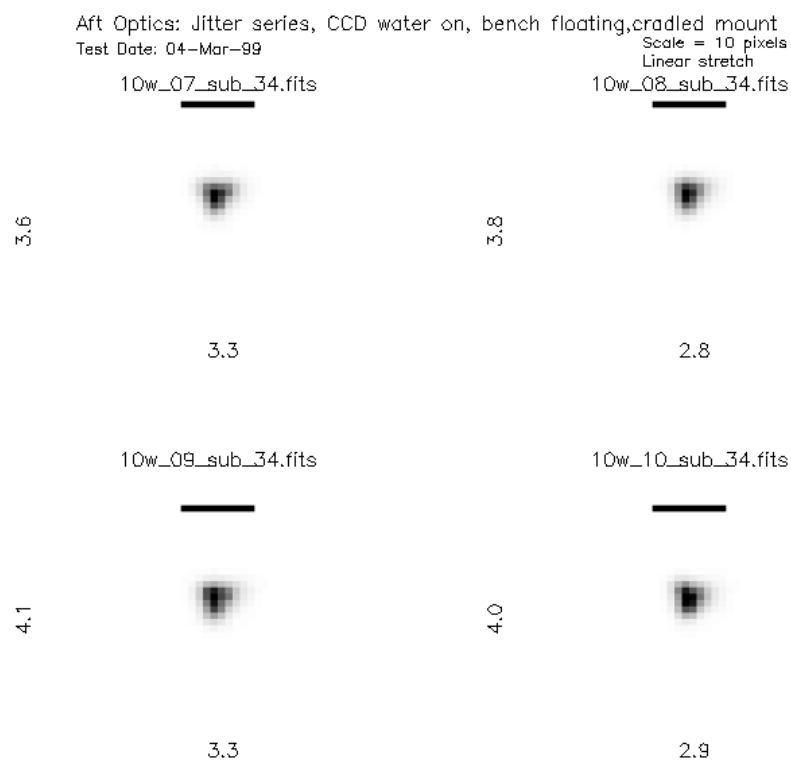
Background clip level: 0.



**Figure 5:** Data analysis plot of image set acquired with the CCD cooling water off.



**Figure 6:** Images #1-6 of the water off series. The Gaussian fwhm vertically and horizontally from strips three pixels wide are indicated to the left and below each image.



**Figure 7:** Images #7-106 of the water off series. The Gaussian fwhm vertically and horizontally from strips three pixels wide are indicated to the left and below each image.